Claims discussion vs 20040091201

Introduction:

In this document, the claims given in Patent Application 10/732,857 entitled the LIGHT TRIGGERED LIGHT SWITCH will be shone to be unique and different from the claims given in United States Patent Application number 20040091201 entitled the OPTICAL MICRO-ACTUATOR, OPTICAL COMPONENT USING THE SAME, AND METHOD FOR MAKING AN OPTICAL MICRO-ACTUATOR. This will be called the OPTICAL MICRO-ACTUATOR as it is in the patent application to save paper and ink. The following Table 1 allows a comparison of the two inventions.

Compare	20040091201	10/732,857
Not same	No transparent piezoelectric mentioned	Transparent piezoelectric is claimed
Not same	Reflection, transmission, refraction, or attenuation switch	On and off switch
Not same	A light channel that has a fluid interface moved in and out of the optical channel	A light channel that closes in time as the piezoelectric material swells under the action of the electric field of light
Not same	Fluid allows light transmittion	Channel is large enough for light to pass
Not same	The fluid interface reflects, refracts, or attenuates the light	Channel is too small so light is stopped
Not same	Electrical control signal applied	Light electrical power
Not same	Control signal moves the interface between optical fluids	Piezoelectric responds to light power changes the dimensions of the channel
Not same	Electrostatic control, voltage generators, electrostatic motors, electric circuits	No electrostatic control, No voltage generators, No motors, No circuits
Not same	Refraction index often sited	Refraction index never mentioned
Not same	Interface of optical fluids	Interface of piezoelectric & light channel
Notes	Signal speed slower than 10^{-9} sec	Light faster than 10^{-11} seconds
Notes	Present technology, no better	More than 100 times faster, much better

Table 1.

In brief, THE LIGHT TRIGGERED LIGHT SWITCH is an on/off switch, and uses the power of light in or near the channel to actuate the switch, and the OPTICAL MICRO-ACTUATOR is not an on/off switch, and does not use the power of the light in or near the channel to actuate the switch. The discussion below works with the words of each patent clearly exposing the differences between these two inventions so that the superior technology of the LIGHT TRIGGERED LIGHT SWITCH may receive the patent protection that it disserves.

Claims discussion:

LIGHT TRIGGERED LIGHT SWITCH Claim 1:

1. The first words of Claim 1 in LIGHT TRIGGERED LIGHT SWITCH read as follows:

"An on and off switch for light in a channel"

In the OPTICAL MICRO-ACTUATOR is not referred to as an on and off switch. U.S. Patent application number 20040091201 never refers to the invention as an on and off or on-off switch.

In the OPTICAL MICRO-ACTUATOR application in paragraph 0025 optical properties for the optical fluids used in the actuator may be reflection, transmission or refraction, but the light is not shut off as it is in the LIGHT TRIGGERED LIGHT SWITCH when the piezoelectric material makes the channel too small.

In the OPTICAL MICRO-ACTUATOR application, in paragraph 0077 optical properties for the optical fluids used in the actuator may be

attenuated if opaque fluids are used, but the light is not shut off as it is in the LIGHT TRIGGERED LIGHT SWITCH when the piezoelectric material makes the channel too small.

Clearly the OPTICAL MICRO-ACTUATOR is not an on and off switch as the LIGHT TRIGGERED LIGHT SWITCH is.

2. The second words in Claim 1 in the LIGHT TRIGGERED LIGHT SWITCH are as follows:

"a channel comprising a transparent piezoelectric light channel"

Nowhere in patent application 20040091201 is a transparent piezoelectric light channel mentioned. An "Other control means, for example piezoelectric, magnetic, thermal, pneumatic means, etc.," is mentioned in paragraph 0034, but the piezoelectric would put pressure on the fluids so that the interface moves across the light channel. They do not have to be transparent since they are not part of the light channel or waveguide as is claimed in Claim 1 of the LIGHT TRIGGERED LIGHT SWITCH. In patent application 20040091201, in paragraph 0117 piezoelectric is mentioned, "using microelectronics techniques (for example, electromagnet or piezoelectric actuator)." Again, this piezoelectric actuator would put pressure on the fluids so that the interface moves across the light channel. They do not have to be transparent since they are not part of the light channel or waveguide as is claimed in Claim 1 of the LIGHT TRIGGERED LIGHT SWITCH.

In paragraph 0003, it is explained that an OPTICAL MICRO-ACTUATOR would modify a light beam in response to a "control signal." The "control signal" would be what turns on the piezoelectric actuator.

Control signals can be switched on and off by a hand actuated switch, an electromagnetic solenoid, a relay, or a transistor circuit. The fastest of these would be the transistor circuit, which can switch at 10^{-9} seconds in the best conditions. This is one billionth of a second. Many devices use transistors to switch and they only achieve 10^{-7} seconds because of the mechanical responses to the signal that the transistor provides. This is a ten millionth of a second. The LIGHT TRIGGERED LIGHT SWITCH is much faster at a one hundred billionth of a second.

Nowhere in the claims of patent application 20040091201 is a piezoelectric element mentioned.

3. The next words in Claim 1 of the disclosure of the LIGHT TRIGGERED LIGHT SWITCH are as follows:

"light channel that is made
A larger in cross section
B smaller in cross section"

The light channels or waveguides in patent application 20040091201 which teaches OPTICAL MICRO-ACTUATOR are not described as getting larger or smaller in the claims or the disclosure, instead the interface between two optically different fluids is moved into the light channel at a cavity numbered 30 in the figures. This cavity of the OPTICAL MICRO-ACTUATOR is not made smaller or larger as the light channel is in the LIGHT TRIGGERED LIGHT SWITCH.

4. The next words in Claim 1 of the LIGHT TRIGGERED LIGHT SWITCH are as follows:

"by the action of the electric field of light passing through the channel"

Nowhere in the patent application 20040091201 is the electric field of the light in the channels referred to.

In the disclosure of the LIGHT TRIGGERED LIGHT SWITCH the DETAILED DESCRIPTION OF THE INVENTION, the second sentence teaches that the electric field of the light acts upon the piezoelectric material to make the switch actuate. From that second sentence on through mathematical calculations with the Poynting vector equation, that is used to explain the way the electric field of the light in the channel actuates the piezoelectric material causing it to expand or contract, and on into the description of each drawing, the light power is triggering the switching.

By actuating a switch with the electric field of the light, switching speeds of less than one hundred billionth of a second (10^{-11}) can be achieved. By actuating a switch by the "electrostatic control means" of claim 1 or "electrostatic motor" of claim 13 or "voltage generator" numbered 58 in figure 1 of the OPTICAL MICRO-ACTUATOR, switching speeds of a billionth of a second 10^{-9} are the fastest that can be achieved. In paragraph 0083, the silicon membrane is said to have a resonant frequency of 100kHz. This membrane would move back and fourth one hundred thousandth of a second (10^{-5}). This is much slower than even transistors can achieve. It is seen that the LIGHT TRIGGERED LIGHT SWITCH of patent application, 10/732,857 far faster and far superior to the OPTICAL MICRO-ACTUATOR, and the LIGHT TRIGGERED LIGHT SWITCH is deserving of patent protection.

5. The next words in Claim 1 of the LIGHT TRIGGERED LIGHT SWITCH are as follows in the A and B portions:

"A by opening to the passage of the light signals
B by closing to the passage of the light signals"

The claims for patent application 20040091201 present the waveguides encountering the cavity that the fluid interface moves in reflecting, reflecting, or attenuating the light signals. This switch changes the direction of the light; it does not close to the passage of light signals, as does the LIGHT TRIGGERED LIGHT SWITCH.

6. The last words in Claim 1 of the LIGHT TRIGGERED LIGHT SWITCH are as follows in the A and B portions:

"A for the switch to be in the on condition
B for the switch to be in the off condition."

The switch being described is an on and off switch. This is different from the OPTICAL MICRO-ACTUATOR, which changes the light signal by reflecting, reflecting, or attenuating.

LIGHT TRIGGERED LIGHT SWITCH Claim 2:

1. The first words of Claim 2 in LIGHT TRIGGERED LIGHT SWITCH read as follows:

"An on and off switch for light in a channel comprising a channel next to a piece of piezoelectric material"

Patent 20040091201, which teaches OPTICAL MICRO-ACTUATOR, has only one independent claim about the function of the actuator, which is the first one. The other independent claims deal with the construction of OPTICAL MICRO-ACTUATORs. Claim 2 in the LIGHT TRIGGERED LIGHT SWITCH is an independent claim and must be compared against Claim 1 of the OPTICAL MICRO-ACTUATOR. The argument will be the same as was presented for Claim 1 in Application 10/732,857. The difference is that the switch described in Claim 2 has no transparent piezoelectric member that carries the light. The piezoelectric member is next to a transparent material that is carrying the light signal, and the light that causes the piezoelectric member to change shapes and closes the channel down. The piezoelectric material used may be transparent, but there are less expensive piezoelectric materials that are not transparent that can be used in a switch that is made as this claim describes.

2. The second words in Claim 2 in the LIGHT TRIGGERED LIGHT SWITCH are as follows:

"where the channel carrying the light is made

A. larger in cross section by the action of the electric field of the light in the channel on the piece of piezoelectric material

B. smaller in cross section by the action of the electric field of the light in the channel on the piece of piezoelectric material"

The switch described here like the one described in Claim 1 the light signal is stopped from passing through the switch because the

electric field of light in the waveguide or channel is causing the piezoelectric material of the switch to move. The movement of the piezoelectric material opens up or closes down the channel to the light. This opening or closing causes the on or off of the switch, because light cannot go through a channel that is as small as a quarter of its wavelength. The switch described in patent application number 20040091201 moves the interface between two optical fluids into a cavity to accomplish the transmission, reflection, refraction, or attenuation of the light into an alternative optical channel.

These are two very different means of switching. The LIGHT TRIGGERED LIGHT SWITCH will switch faster than a hundred billionth of a second. The OPTICAL MICRO-ACTUATOR will not be able to achieve switching in less than a billionth of a second. In this switch, the waveguide that is made smaller as the piezoelectric material gets bigger must be made out of a flexable material so that it can respond to the pressure of the piezoelectric material.

3. The next words in Claim 2 of the disclosure of the Light Triggered Light Switch are as follows:

"A. that by contracting opens the light carrying channel to light signals"

B. that by expanding into the light carrying channel closes the light channel to light signals"

Divoux et. al. in patent application 20040091201 which teaches OPTICAL MICRO-ACTUATOR has a cavity that the interface between two optical fluids move because a control signal actuates a electrostatic control means. Application 11/732,857 has piezoelectric material that in a very short time change their

dimensions to close off a light channel in response to the electric field of light. These are two very different means of operation, and Application 11/732,857 is superior because it can switch more than 100 times faster.

4. The next words in Claim 2 of the disclosure of the LIGHT TRIGGERED LIGHT SWITCH are as follows:

> "A. causing the on condition
> B. causing the off condition"

The LIGHT TRIGGERED LIGHT SWITCH claims to be an on/off switch. Nowhere in the claims of Patent number 20040091201 is on and off mentioned. The LIGHT TRIGGERED LIGHT SWITCH stops light from continuing down a waveguide or channel. The OPTICAL MICRO-ACTUATOR transmits, reflects, refracts, or attenuates in passing from one channel to another.

LIGHT TRIGGERED LIGHT SWITCH Claim 3:

1. The first words of Claim 3 in LIGHT TRIGGERED LIGHT SWITCH read as follows:

"An on and off switch for light signals in a channel comprising a compressible fluid portion of the channel with a side that is composed of a piezoelectric material"

The arguments for this claim are the same as for Claim 2. The difference is that the material of the wave-guide that the piezoelectric part moves into a compressible fluid instead of compressing a solid. Figure 3 A and B show the compressible fluid

before and during response to the electric field of the light in the channel. No interface between fluids is moved in the LIGHT TRIGGERED LIGHT SWITCH where in the OPTICAL MICRO-ACTUATOR as seen in Figures 1, 2A, 2B, 8, 9, 10, 11, 12, 13, 14, 15, and 16 the interface between the optical fluids is moved. The speed of the LIGHT TRIGGERED LIGHT SWITCH comes from the response of the piezoelectric crystal to the electric field of the light. The reason the OPTICAL MICRO-ACTUATOR is so much slower is that signals switched in transistors or slower mechanisms must mechanically or thermally push bubbles around to effect the switching. The LIGHT TRIGGERED LIGHT SWITCH is more than 100 times faster.

2. The second words of Claim 3 in LIGHT TRIGGERED LIGHT SWITCH read as follows:

"piezoelectric material that responds to the electric field in the light in the channel to
A. Contract the piezoelectric wall of the channel to open up
B. Expanding into the light channel to close"

As is illustrated in Figures 3A and 3B the LIGHT TRIGGERED LIGHT SWITCH associated with Application 10/732,857 uses the response of piezoelectric material to the electric field of light to open up or close down the dimensions of the light channel so that light can pass through it or is too small for the light to pass through it. As is illustrated by Figures 1, 2A, 2B, 8, 9, 10, 11, 12, 13, 14, 15, and 16 of the OPTICAL MICRO-ACTUATOR, which is has been given patent application number 20040091201, the modification of the light in the light channel is effected by the manipulation of the interface of two optical fluids into the path of the light signal that

is to be switched. These are two different mechanisms. The speed with which invention described in Application 10/732,857 can switch the signal off is much faster than the invention described in patent application number 20040091201 can, because the electric field of light is switching the LIGHT TRIGGERED LIGHT SWITCH. The OPTICAL MICRO-ACTUATOR depends upon a "control signal" (mentioned in paragraph 0003), which is turned on by a hand switch, solenoid, relay, or transistor to send electricity to push a bubble around by heat or pressure. The transistor switch would be the fastest at 10^{-9} seconds (that is a billionth of a second). The signal then must cause piezoelectric material to put pressure on the gas bubble or the micromechanical device to put pressure on the gas bubble or the heater to heat up the bubble to expand it. These operations make the switch slower than the transistor. Actually the speed that this switch will only be able to switch at 10^{-7} seconds (that is a ten millionth of a second). The LIGHT TRIGGERED LIGHT SWITCH will switch faster than 10^{-11} seconds (that is a hundred billionth of a second). If the proper wavelength is used the LIGHT TRIGGERED LIGHT SWITCH could switch at 10^{-13} seconds (that is a ten trillionths of a second). It is seen that the LIGHT TRIGGERED LIGHT SWITCH is not the same as the OPTICAL MICRO-ACTUATOR, and the LIGHT TRIGGERED LIGHT SWITCH is superior and should be granted patent protection.

3. The last words of Claim 3 in LIGHT TRIGGERED LIGHT SWITCH read as follows:

A. " the channel to larger dimensions so that the light signal easily passes through the channel causing the on condition.
B. the light channel to smaller dimensions so that the light signal may not pass through the channel causing the off condition."

These words show that the way that the LIGHT TRIGGERED LIGHT SWITCH turns off the light is by the dimensions of the channel is wider to let the light through or the dimensions of the channel is smaller to stop the light from passing through the channel. It is pointed out in the DETAILED DESCRIPTION OF THE INVENTION section of Application 10/732,857 that when a light channel or waveguide is shrunken to a given dimension then light of 8056 angstroms will no longer pass through it. Lights of shorter wavelength can still pass through it. The 8056 angstrom or longer wavelength light would be the one that is the signal that is switched on or off. The light that is doing the switching could be shorter wavelengths that can still pass and their electric field is effecting the change in dimensions by acting on the piezoelectric material. This specific example is given to teach that the light of specific wavelength and power will switch on or off a signal in an other specific wavelength. Light is fast and is capable of turning on or off a light signal much faster than the moving the interface of the optical fluid described in Divoux et. al., U.S.P. Application No.20040091201 column 5 lines 34 to 50.

LIGHT TRIGGERED LIGHT SWITCH Claim 4:

The words of the Claim 4 in LIGHT TRIGGERED LIGHT SWITCH read as follows:

"A light switch as claimed in claims one, two, or three that is actuated by the power of the switching light, which is the same wavelength as the light signal in the channel that is switched on and off."

This claim teaches that light that is sufficient power to trigger the switching the LIGHT TRIGGERED LIGHT SWITCH may be of the same wavelength as the light signal that is in the channel that the switch is used to turn on or shut off. The electric field of light is never mentioned in Divoux et. al., U.S.P. Application No 20040091201 the power of light is never mentioned in Divoux et. al., U.S.P. Application No 20040091201. In the LIGHT TRIGGERED LIGHT SWITCH of Application 10/732,857 in the BEST MODE FOR CARRING OUT THE INVENTION, section the Poynting vector equation is used to calculate the exact response to be expected from a piezoelectric element from a specific power of light in watts. Clearly, these are different inventions.

LIGHT TRIGGERED LIGHT SWITCH Claim 5:

The words of Claim 5 of the LIGHT TRIGGERED LIGHT SWITCH APPLICATION READ as follows:

"A light switch as claimed in claims one, two, or three that is actuated by the power of the switching light, which is a shorter wavelength than the light signal in the channel that is switched on and off."

This claim teaches that light that is sufficient power to trigger the switching the LIGHT TRIGGERED LIGHT SWITCH may be a shorter wavelength than the light signal that is in the channel that the switch is used to turn on or shut off. The electric field of light is never mentioned in Divoux et. al., U.S.P. Application No 20040091201. The power of light is never mentioned in Divoux et. al., U.S.P. Application No 20040091201. In the LIGHT TRIGGERED LIGHT SWITCH of Application 10/732,857 in the

BEST MODE FOR CARRING OUT THE INVENTION, section the Poynting vector equation is used to calculate the exact response to be expected from a piezoelectric element from a specific power of light in watts. Clearly, these are different inventions.

LIGHT TRIGGERED LIGHT SWITCH Claim 6:

1. The words of Claim 6 of the LIGHT TRIGGERED LIGHT SWITCH application read as follows:

"A light switch as claimed in claims one, two, or three that is actuated by the power of the switching light,"

This claim teaches that light that is sufficient power to trigger the switching the LIGHT TRIGGERED LIGHT SWITCH may be a shorter wavelength than the light signal that is in the channel that the switch is used to turn on or shut off. The electric field of light is never mentioned in Divoux et. al., U.S.P. Application No 20040091201. The power of light is never mentioned in Divoux et. al., U.S.P. Application No 20040091201. In the LIGHT TRIGGERED LIGHT SWITCH of Application 10/732,857 in the BEST MODE FOR CARRING OUT THE INVENTION, section the Poynting vector equation is used to calculate the exact response to be expected from a piezoelectric element from a specific power of light in watts. Clearly, these are different inventions.

2. The next of Claim 6 of the LIGHT TRIGGERED LIGHT SWITCH application reads as follows:

"which is a longer wavelength than the light signal in the channel that is switched on and off"

This claim teaches that the light signal that is switched on or off can be switched on or off by a light signal that is longer in wavelength. Claim 4 and 5 teach that the light signal that is switched on or off can be switched on or off by a light signal that is the same or a shorter wave length than the light signal that is being switched on or off. This switching by light is the key advantage of this the Application 10/732,857, which teaches LIGHT TRIGGERED LIGHT SWITCH. Light is so much quicker than control signals. Patent Application number 20040091201 is turned on or off by a "control signal" as is seen in paragraph 0003. These two inventions are very different in their action.

LIGHT TRIGGERED LIGHT SWITCH Claim 7:

The words of Claim 7 of the LIGHT TRIGGERED LIGHT SWITCH APPLICATION READ as follows:

"A light switch for light signals as claimed in claim one where the piezoelectric material is transparent to the light passing through it."

There are many materials mentioned in Application 10/732,857 that are piezoelectric these are quartz (SiO_2), lithium niobate ($LiNbO_3$), lead zirconate ($PbZrO_3$), lead titanate ($PbTiO_3$), and lead zirconate titanate. Lead zirconate titanate is also called PZT. Of these lithium niobate and quartz are transparent. In Claim 1 of the Light Triggered Light Switch the light channel is composed of transparent piezoelectric material and changes dimensions as the switching light signal acts upon it as Figures 1A and 1B illustrate. Nowhere in Patent 20040091201 is a transparent piezoelectric element mentioned. Nowhere in Patent Application 20040091201 does a

light channel change physical dimensions. The light of Patent Application 20040091201 show that the light channels cross the cavity where they either go through optical liquid one or are transmitted, reflected, refracted or attenuated by the interface of the two optical fluids. The piezoelectric element referred to paragraph 0034 is in a list including magnetic, thermal, and pneumatic means indicating that other control means can be used to move the interface between the optical fluids in patent application 20040091201 these would all be is actuated by a "control signal" spoken of in paragraph 0003 and, as has been discussed, is slow relative to the LIGHT TRIGGERED LIGHT SWITCH. The same is true of the reference to piezoelectric actuator in paragraph 0117. Here it is listed with an electromagnet indicating alternative methods for moving the wall of the fluid filled chamber. These would all be is actuated by a "control signal" spoken of in paragraph 0003 and, as has been discussed, is slow relative to the LIGHT TRIGGERED LIGHT SWITCH which is actuated by the voltage in light in the optical channel. The voltage of light is not mentioned in patent application 20040091201.

LIGHT TRIGGERED LIGHT SWITCH Claim 8:

The words of Claim 8 of the LIGHT TRIGGERED LIGHT SWITCH APPLICATION READ as follows:

"A light switch for light signals as claimed in claim three where the compressible fluid is a gas"

Figure 3A and 3B of the LIGHT TRIGGERED LIGHT SWITCH application show the area that the piezoelectric part of the switch responds to the electric field of the light to open or close. Claim 8

teaches that the area that the piezoelectric part can be expanding into can be filled with a gas. There is no mention of an interface between two optical fluids being pushed around so that light will bounce off of it as is illustrated in Figures 1, 2A, 2B, 9, 10, 12, 13, 14, 15, and 16 of Divoux et. al., U.S.P. Application No. 2004009120. The reason there is no mention of an interface between two optical fluids in the application of the LIGHT TRIGGERED LIGHT SWITCH is that the function of the two switches is completely differently.

LIGHT TRIGGERED LIGHT SWITCH Claim 9:

The words of Claim 9 of the LIGHT TRIGGERED LIGHT SWITCH APPLICATION READ as follows:

"A light switch for light signals as claimed in claim three where the compressible fluid is a mixture of gases."

Figure 3A and 3B of the LIGHT TRIGGERED LIGHT SWITCH show the area that the piezoelectric part of the switch responds to the electric field of the light to open or close. Claim 8 teaches that the area that the piezoelectric part can be expanding into can be filled with a gas. There is no mention of interface between two optical fluids being pushed around so that light will bounce off of it as is illustrated in Figures 1, 2A, 2B, 9, 10, 12, 13, 14, 15, and 16 of Divoux et. al., U.S.P. Application No. 20040091201. The reason there is no mention of an interface between optical fluids in the LIGHT TRIGGERED LIGHT SWITCH application is that the functions of the two switches are completely different.

LIGHT TRIGGERED LIGHT SWITCH Claim 10:

The words of Claim 10 of the LIGHT TRIGGERED LIGHT SWITCH APPLICATION READ as follows:

"A light switch for light signals as claimed in claim three where the compressible fluid is a liquid."

Figure 3A and 3B of the LIGHT TRIGGERED LIGHT SWITCH application show the area that the piezoelectric part of the switch responds to the electric field of the light to open or close. Claim 8 teaches that the area that the piezoelectric part can be expanding into can be filled with a gas. There is no mention of a interface between two optical fluids being pushed around so that light will bounce off of it as seen in Figures 1, 2A, 2B, 8, 9, 10, 11, 12, 13, 14, 15, and 16 of Divoux et. al., U.S.P. Application No. 20040091201. The reason there is no mention of an interface between two optical fluids in the LIGHT TRIGGERED LIGHT SWITCH application is that the functions of the two switches are completely different. The light channel is closed down by the movement of the piezoelectric element responding to the voltage of the light in the channel.

LIGHT TRIGGERED LIGHT SWITCH Claim 11:

The words of the Claim 11 of the LIGHT TRIGGERED LIGHT SWITCH APPLICATION READ as follows:

"A light switch for light signals as claimed in claim three where the compressible fluid is a mixture of liquids."

Figure 3A and 3B of the LIGHT TRIGGERED LIGHT SWITCH application show the area that the piezoelectric part of the switch responds to the electric field of the light to open or close. Claim 8 teaches that the area that the piezoelectric part can be expanding into can be filled with a gas. There is no mention of the interface between two optical fluids being pushed around so that light will bounce off of it as is illustrated in Figures 1, 2A, 2B, 8, 9, 10, 11, 12, 13, 14, 15, and 16 of Divoux et. al., U.S.P. Application No. 20040091201. The reason there is no mention of the interface between two optical fluids in the LIGHT TRIGGERED LIGHT SWITCH application is that the functions of the two switches are completely different. The LIGHT TRIGGERED LIGHT SWITCH closes down the dimensions of the light channel so that the light signal can no longer pass through it.

LIGHT TRIGGERED LIGHT SWITCH Claim 12:

The words of Claim 12 of the LIGHT TRIGGERED LIGHT SWITCH APPLICATION READ as follows:

"A light switch for light signals as claimed in claims two and three were more than one wall of the switch is piezoelectric material that responds to the electric field of the light in the channel turning the switch on and off."

This claim teaches that the LIGHT TRIGGERED LIGHT SWITCH is actuated by the power of light passing through the light channel; the index of refraction is not involved, as the piezoelectric material responds. The OPTICAL MICRO-ACTUATOR, patent 20040091201, never mentions the electric field of the light in the waveguides. However, the refraction index change or optical index change that

occurs when the interface between two optical fluids is force into the cavity as Figures 1, 2A, 2B, 8, 9, 10, 11, 12, 13, 14, 15, and 16 show is the key to how the OPTICAL MICRO-ACTUATOR works.

LIGHT TRIGGERED LIGHT SWITCH Claim 13:

The words of Claim 13 of the LIGHT TRIGGERED LIGHT SWITCH APPLICATION READ as follows:

"A light switch for light signals as claimed in claims one, two, and three were the piezoelectric material responds to power level of the light in the channel turning the switch on and off."

This claim teaches that the power level of light passing through the light channel actuates the LIGHT TRIGGERED LIGHT SWITCH; the index of refraction is not involved, as the piezoelectric material responds. The OPTICAL MICRO-ACTUATOR, patent 20040091201, never mentions the electric field of the light in the waveguides. However, the refraction index change that occurs when the interface between two optical fluids is force into the cavity as Figures 1, 2A, 2B, 8, 9, 10, 11, 12, 13, 14, 15, and 16 show is the key to how the OPTICAL MICRO-ACTUATOR works.

LIGHT TRIGGERED LIGHT SWITCH Claim 14:

The words of Claim 14 of the LIGHT TRIGGERED LIGHT SWITCH APPLICATION READ as follows:

"A light switch for light signals as claimed in claims one, two and three where the light that accomplishes the switching of the light signal in the channel is imposed upon a conductor near the light channel with the signal that is switched in it."

This claim teaches that the LIGHT TRIGGERED LIGHT SWITCH is actuated by the light signal passing near the light channel, the index of refraction is not involved, as the piezoelectric material responds to the light signal actuating the switch. The OPTICAL MICRO-ACTUATOR, patent application 20040091201, uses the change of the refractive index when the interface between two optical fluids as is pictured in Figures 1, 2A, 2B, 8, 9, 10, 11, 12, 13, 14, 15, and 16 of Divoux et. al., U.S.P. Application No.20040091201, is pushed around so that light will be transmitted, reflected, refracted, or attenuated. The two switches function completely differently.

Appendix A

The following is a discussion of the claims made in United States Patent Application number 20040091201 entitled the Optical micro-actuator, optical component using the same, and method for making an optical micro-actuator by Divoux et. al., the claims will be handled in order from first to last with out being numbered.

OPTICAL MICRO-ACTUATOR Claims:
"Optical micro-actuator comprising a cavity (30) formed between at least one optical input channel (12, 12a, 12b) and at least one optical output channel (14, 14a, 14b),"

The whole object of the OPTICAL MICRO-ACTUATOR is to reflect the light into the second channel or alter the light before going into the second channel, while the LIGHT TRIGGERED LIGHT SWITCH teaches how the electric field of the light can shut off the light passing through the switch.

The second words of Claims in the OPTICAL MICRO-ACTUATOR are as follows:

"the cavity being capable of containing at least one first optical fluid and one second optical fluid (32, 33, 34, 35), with at least one different optical property,"

The cavity is crossed by the optical channels. The optical channels passing through the cavity and interact with the surface of the interface between the two optical fluids. As the light hits the interface between the interface the light is transmitted, refracted, reflected, or attenuated that the switch is designed to do to the light in the channel. When the interface is not in the way of the light the light passes through the OPTICAL MICRO-ACTUATOR with out being affected. In the disclosure of the LIGHT TRIGGERED LIGHT SWITCH one finds described the wall of the wave-guide closes in to shut off the light signal (Figure 1B, 2B, and 3B).

The next words of Claims in the OPTICAL MICRO-ACTUATOR are as follows:

"and means of modifying the position of an interface between the first and second optical fluids with respect to the optical channels,"

The interfaces between the two optical fluids move in the cavity affecting the light passing through the optical channels. The walls of the cavity or the optical channel do not change to a different dimension as do the sides of the waveguide in the LIGHT TRIGGERED LIGHT SWITCH (Figure 1B, 2B, and 3B). The walls of the cavity of patent 20040091201 are at an angle from the optical

channel path (Figure 14). The thing that changes in an OPTICAL MICRO-ACTUATOR is the interface between optical fluid one and the second optical fluid. The light passes straight through the LIGHT TRIGGERED LIGHT SWITCH when the power of the light in or near the waveguide path is week and the voltage in it is not sufficient to bend the walls of the channel. Clearly, these two switches function in completely different ways.

The next words of the Claims in the OPTICAL MICRO-ACTUATOR are as follows:

"in which the means of modifying the position of the interface comprise at least one chamber (40, 41, 43) containing at least one fluid in fluid contact with the cavity (30),"

Modifying the position of the interface between the optical fluids is the way the OPTICAL MICRO-ACTUATOR changes the light that it transmits, reflects, refracts, or attenuates. In the LIGHT TRIGGERED LIGHT SWITCH, light in or near to the wageguide or light channel is of sufficient power to cause the piezoelectric material in the switch to change dimensions so that the light can no longer pass through the channel. That is as is claimed in Claims 1, 2, and 3 of the LIGHT TRIGGERED LIGHT SWITCH. Clearly, these switches described in patent 20040091201 and those in application 10/732,857 function completely differently.

The next words of Claims in the OPTICAL MICRO-ACTUATOR are as follows:

"and electrostatic control means (44, 46, 80) to modify the volume of the chamber."

Here it is the "electrostatic control means" causing the interface between the two optical fluids to move by changing the volume of the chamber. In paragraphs 0003 and 0032, it is clear that this electrostatic control means is run by a "control signal."
Here it is the "control signal" causing the interface between optical fluid one and two to move to the cavity. This is the same as the electrical signal mentioned in Description of the Prior Art part of Application 10/732,857 where United States Patent number 6,594,411, which teaches OPTICAL SWITCH, and is issued to Yueh Liang Chung etal. On July 15 of 2003, is referenced. Patent 6,594,411 makes mention of a piezoelectric element. The piezoelectric element is actuated by an electrical signal. Again, a manual switch, relay, solenoid, or transistor must switch an electrical signal or "control signal." The fastest of these is the transistor, which can switch in a billionth of a second (10^{-9} seconds). In the LIGHT TRIGGERED LIGHT SWITCH, the light in the channel crosses the switch dimensions in 10^{-13} seconds or faster depending on the size of the switch. Making the LIGHT TRIGGERED LIGHT SWITCH far superior in design that patent 6,594,411 or patent application 20040091201, because the piezoelectric elements the switches claimed in the claims of application 10/732,857 responds to the electric field of the light passing through the waveguide of the switch. The response of the piezoelectric elements in the LIGHT TRIGGERED LIGHT SWITCH can easily cause the switch to turn on and off faster than 10^{-11} seconds.

More OPTICAL MICRO-ACTUATOR Claims read:

"Optical micro-actuator according to claim 1, in which the means of modifying the volume of the chamber comprise a deformable membrane (44, 45) forming a wall of the chamber."

This claim deals with a deformable membrane that changes the volume of the chamber filled with optical fluid to move the interface of the fluid in the switch into the cavity so the light will be transmitted, reflected, refracted, or attenuated in passing through the fluid filled cavity. There is an electrical signal that actuates the deformation of the membrane. The electrical signal will be switched on or off by some means previously invented like a hand switch, a solenoid, a relay, or a transistor. The fastest of these is a transistor, which can at the fastest switch in a billionth of a second (10^{-9}), and then the heater has to boil the fluid. A hundred millionth (10^{-8}) or a ten millionth (10^{-7}) of a second is the fastest that the OPTICAL MICRO-ACTUATOR can hope to switch. The LIGHT TRIGGERED LIGHT SWITCH is turned on or off by the electric field of light. The LIGHT TRIGGERED LIGHT SWITCH will switch faster than a hundred billionth of a second (10^{-11}) at the slowest. The LIGHT TRIGGERED LIGHT SWITCH can switch in a ten trillionth of a second (10^{-13}), if one chooses the proper wavelength to do the switching. The LIGHT TRIGGERED LIGHT SWITCH is clearly superior to the OPTICAL MICRO-ACTUATOR and should be granted patent protection.

Claims in Divoux et. al., U.S.P. Application No 20040091201 read as follows:
"Micro-actuator according to claim 2, comprising a first electrode fixed to the deformable membrane (44) and a second electrode fixed to a rigid support (46) placed facing the first electrode."

It the voltage that will be applied between the first and second electrode is what switches the OPTICAL MICRO-ACTUATOR, and the control signal of paragraph 0003 will turn on this voltage. The fastest this method of switching is going to be able to switch in 10^{-7} seconds or 10^{-8} seconds because a hand switch, solenoid, relay, or a transistor will turn on the "control signal." The fastest of these is the transistor switching in 10^{-9} seconds. This is very different from the words of Application 10/732,857 for the LIGHT TRIGGERED LIGHT SWITCH. Which are as follows: "the action of the electric field of light" that is used in Claim 1, or "action of the electric field of the light" that is used in Claim 2, or "responds to the electric field in the light" that is used in Claim 3, or "actuated by the power of the switching light" that is used in Claims 4, 5, and 6, or "that responds to the electric field of the light" that is used in Claim12. The LIGHT TRIGGERED LIGHT SWITCH will be able to be switched in 10^{-11} seconds or faster. This much faster switch should be granted patent protection.

More OPTICAL MICRO-ACTUATOR Claims by Divoux et. al., U.S.P. Application No 20040091201 read as follows :

"Micro-actuator according to claim 2, in which the membrane (44) has a free surface the area of which is greater than the area of one section of the cavity."

This claim teaches that the membrane is larger in surface area than the cross section of the cavity so that when the membrane moves a little the interface between the two optical fluids moves a longer distance in the cavity. The movement of this interface is the action of the OPTICAL MICRO-ACTUATOR. Figures 1A, 1B, 2A, 2B, 3A,

and 3B show that the light signals in the LIGHT TRIGGERED LIGHT SWITCH travel along the light switch that is actuated by the movement of the piezoelectric element acted upon by the electric field of the light in the waveguide. These switches operate on completely different principals.

More OPTICAL MICRO-ACTUATOR Claimsare as follows:

"Micro-actuator according to claim 1, in which it the chamber comprises at least one flexible wall and contains at least one substantially incompressible fluid (31, 32)."

The flexible wall and the incompressible fluid allows the OPTICAL MICRO-ACTUATOR to move the interface between the two optical fluids in the cavity across the path of the light passing from the optical channel on one side of the cavity to the other. This is very different mechanism than is described in Claims 1, 2, and 3 of the LIGHT TRIGGERED LIGHT SWITCH that teach that the physical dimensions of the light channel are opened up or closed off by the action of the electric field of the light on piezoelectric elements.

More OPTICAL MICRO-ACTUATOR Claims are as follows:

"Micro-actuator according to claim 1, in which the chamber has rigid walls, and contains at least one compressible fluid."

The incompressible fluid needed for moving the interface of two optical fluids into the path of light passing through the cavity so that the light signal will be transmitted, reflected, refracted, or

attenuated by the interface of the two optical fluids. The light signal would have crossed the cavity when it was filled with the liquid. This is very different mechanism than is described in Claims 1, 2, and 3 of the LIGHT TRIGGERED LIGHT SWITCH that teach that the physical dimensions of the light channel are opened up or closed off by the action of the electric field of the light on piezoelectric elements. The LIGHT TRIGGERED LIGHT SWITCH is very different from the OPTICAL MICRO-ACTUATOR and should be granted patent protection.

More OPTICAL MICRO-ACTUATOR Claims are as follows:
"Micro-actuator according to claim 1, comprising a plurality N of optical input channels (12a, 12b) and a plurality M of optical output channels (14a, 14b), in which each optical input channel may be selectively connected to at least one of the optical output channels through the cavity."

This claim makes clear that the action of the OPTICAL MICRO-ACTUATOR is diverting light from one channel into another. The interface between two optical fluids is moved to the cavity and the light is reflected. This is not how the LIGHT TRIGGERED LIGHT SWITCH works. In Claim 1 of the LIGHT TRIGGERED LIGHT SWITCH the words are as follows:

"light channel that is made
A larger in cross section by opening to the passage of the light signals
B smaller in cross section by closing to the passage of the light signals"

In Claim 2 of the LIGHT TRIGGERED LIGHT SWITCH the words are as follows:

"where the channel carrying the light is made
A.larger in cross section by the action of the electric field of the light in the channel on the piece of piezoelectric material
B.smaller in cross section by the action of the electric field of the light in the channel on the piece of piezoelectric material"

In Claim 3 of the LIGHT TRIGGERED LIGHT SWITCH the words are as follows:

"A. Contract the piezoelectric wall of the channel to open up
B. Expanding into the light channel to close"

The two switches function differently. Patent 20040091201 teaches the moving of a bubble to divert light, while Application 10/732,857 teaches the optical waveguide is physically made large enough or pinched down to be too small to turn on or shut off the light.

More OPTICAL MICRO-ACTUATOR Claims are as follows:

"Micro-actuator according to claim 1, comprising at least one first optical guide forming at least one input channel and at least one second optical guide forming at least one output channel."

Divoux et. al., U.S.P. Application No. 20040091201 teaches that these optical wave guides come into the cavity where the interface between two optical fluids transmit, reflect, refract, or attenuate the light signal passing through the light channels. These changes in

the light by interacting with the interface between two optical fluids are the way that patent application 20040091201 switches. The switching function of the OPTICAL MICRO-ACTUATOR is controlled by the change in the position of the interface between two optical fluids in the cavity in the switch. This is very different from what Application 10/732,857 describes as the function of the switch that it teaches. An interface between optical fluids is never mentioned in Application 10/732,857. An interface between two optical fluids has nothing to do with the function of the LIGHT TRIGGERED LIGHT SWITCH. In Claim 1 of the LIGHT TRIGGERED LIGHT SWITCH the words are as follows:

"light channel that is made
A.larger in cross section by opening to the passage of the light signals
B.smaller in cross section by closing to the passage of the light signals"

In Claim 2 of the LIGHT TRIGGERED LIGHT SWITCH the words are as follows:

"where the channel carrying the light is made
A. larger in cross section by the action of the electric field of the light in the channel on the piece of piezoelectric material
B. smaller in cross section by the action of the electric field of the light in the channel on the piece of piezoelectric material"

In Claim 3 of the LIGHT TRIGGERED LIGHT SWITCH the words are as follows:

"A. Contract the piezoelectric wall of the channel to open up

B. Expanding into the light channel to close"

The two switches function differently. Patent 20040091201 teaches the moving of a bubble to divert light, while Application 10/732,857 teaches the optical waveguide is physically made large enough or pinched down to be too small to turn on or shut off the light.

More OPTICAL MICRO-ACTUATOR Claims are as follows:

"and/or at least one driving fluid (31) with or without direct contact with at least one of the first and second optical fluids."

This portion of claim nine of Divoux et. al., U.S.P. Application No. 20040091201 teaches about the driving fluid that pushes the optical interface between the first and second optical fluids into the cavity where the light signal is affected by the switch. The driving fluid is transfers the pressure that is applied by the "Other control means, for example piezoelectric, magnetic, thermal, pneumatic means, etc.," is mentioned in paragraph 0034, that would be actuated by a "control signal" as mentioned in paragraph 0003. The pressure might also be put on the driving fluid by "electrostatic control means" mentioned in paragraph 0078 and 0103 and 0107, which would be activated by a "control signal" As would the "electrostatic motor" of paragraph 0117. These "control signals" can be switched on and off by a hand actuated switch, an electromagnetic solenoid, a relay, or a transistor circuit. The fastest of these would be the transistor circuit, which can switch at 10^{-9} seconds in the best conditions. This is one billionth of a second. Many devices use transistors to switch and they only achieve 10^{-7} seconds because of the mechanical responses to the signal that the transistor provides.

This is a ten millionth of a second. The LIGHT TRIGGERED LIGHT SWITCH is much faster at a one hundred billionth of a second, because it uses the electric field of light to actuate the switch.

More OPTICAL MICRO-ACTUATOR Claims are as follows:

"Micro-actuator according to claim 1, in which the chamber comprises a bladder (43)"

Compressing the bladder to move the interface of the two optical fluids to interact with the light passing through the cavity with require a "control signal" as the patent application for the OPTICAL MICRO-ACTUATOR mentions in paragraph 0003. This control signal can be turned on by a hand actuated switch, an electromagnetic solenoid, a relay, or a transistor circuit. The fastest of these would be the transistor circuit, which can switch at 10^{-9} seconds. The LIGHT TRIGGERED LIGHT SWITCH can switch in 10^{-13} seconds because it is switched by the power in the light in the light channel. The LIGHT TRIGGERED LIGHT SWITCH is clearly 10000 times faster than the OPTICAL MICRO-ACTUATOR and is therefore far superior to the OPTICAL MICRO-ACTUATOR. The LIGHT TRIGGERED LIGHT SWITCH should be granted patent protection.

The words in the claim of the OPTICAL MICRO-ACTUATOR patent application are as follows:

"containing at least one of a driving fluid and an optical fluid, and the means of modifying the volume of the chamber comprise means (80) of compressing the bladder."

One optical fluid because the other optical fluid is the gas above it in the cavity so there is an interface between two optical fluids. Figure 11 shows a lever that is pushed down on the bladder to push the interface between the two optical fluids in the cavity into the path of the light signals moving along the optical channels. The interface between two optical fluids is never mentioned in the patent application for the LIGHT TRIGGERED LIGHT SWITCH. The LIGHT TRIGGERED LIGHT SWITCH closed down the dimensions of the optical channel until the dimensions do not allow the passage of the light signal. This is a very different method of switching the signal. The LIGHT TRIGGERED LIGHT SWITCH should be granted patent protection.

More OPTICAL MICRO-ACTUATOR Claims are as follows:

"Micro-actuator according to claim 1, comprising at least one first chamber (40) in fluid relation with the cavity (30) and at least one second chamber (40a, 41) in fluid relation with the cavity"

Divoux et. al., U.S.P. Application No. 20040091201 functions by the forcing of the interface between two optical fluids in the cavity up and down to interfere with the light passing through the light of the optical channels that passes through the cavity. This claim is for sending the light in the light channel through two interactions with the interface between two optical fluids seen in Figure 15. This is completely different from the opening and closing of the optical

channel as the piezoelectric element responds to the electric field of the light in the channel that is claimed in the claims of.

The words of Claims in the OPTICAL MICRO-ACTUATOR patent application are as follows:

"and in which the means of modifying the volume of the chamber comprise at least one deformable membrane (44, 45) forming a wall of at least one chamber."

The deformable membrane is made to move by applying a voltage. How is this voltage applied? Paragraph 0003 states that a control signal is used. How is this control signal turned on? Nowhere in Divoux et. al., U.S.P. Application No. 20040091201 is the voltage of light mentioned, while in patent application 10/732,857 the LIGHT TRIGGERED LIGHT SWITCH the section called DETAILED DESCRIPTION OF THE INVENTION, the second sentence teaches that the electric field of the light acts upon the piezoelectric material to make the switch actuate. From that second sentence on through mathematical calculations with the Poynting vector equation, that is used to explain the way the electric field of the light in the channel actuates the piezoelectric material causing it to expand or contract, and on into the description of each drawing, the light power is triggering the switching. The control signal of the OPTICAL MICRO-ACTUATOR will be supplied from a switch like a transistor that will switch slower than that is a billionth of a second. The voltage of light used by the LIGHT TRIGGERED LIGHT SWITCH will switch faster than one hundred billionth of a second, which is much faster than the OPTICAL MICRO-ACTUATOR witch does not use the voltage of light to switch.

More OPTICAL MICRO-ACTUATOR Claims are as follows:

" Micro-actuator according to claim 11, comprising a vent duct (49) connecting the second chamber (40a) in fluid relation with the cavity, to a chamber (47) located on one side of the membrane (44) opposite the cavity (30)."

This claim allows the gas that is the top optical fluid in Figure 16 to equalize with the gas below the membrane that is moved to shift the interface between the bottom optical fluid in Figure 16 in the cavity (30) so that the light in the optical channel will interact with the interface. In patent application 10/732,857 the LIGHT TRIGGERED LIGHT SWITCH an interface between the piezoelectric material and the light channel that it pushes into in response to the voltage of the light in the channel is mentioned several times. The interface between two optical fluids and the interface between an opaque piezoelectric solid and the transparent optical channel are very different. The interface between the optical fluids is moved by a control signal and the piezoelectric responds to the voltage of a light signal. Control signals are slower than light signals. Light signals are more than 100 times faster. Light signals may be as much as 10,000 times faster. The claims of the LIGHT TRIGGERED LIGHT SWITCH are different from the OPTICAL MICRO-ACTUATOR and should be granted patent protection.

More OPTICAL MICRO-ACTUATOR Claims are as follows:

"Micro-actuator according to claims, in which each chamber comprises a deformable membrane (44, 45) "

The deformable membrane moves and pushes the optical interface between two optical fluids so that the interface moves into the light signal in the optical channel to transmit, reflect, refract, or attenuate the light signal. This patent application never claims or mentions "on or off" or "on and off" functions as patent application 10/732,857 the LIGHT TRIGGERED LIGHT SWITCH DOES. The LIGHT TRIGGERED LIGHT SWITCH CLOSES down the dimensions of the optical channel so light will not pass through it. It shuts off the light signal. This is different from the OPTICAL MICRO-ACTUATOR.

More OPTICAL MICRO-ACTUATOR Claims are as follows:

"moved by an electrostatic motor."

The question is what actuates the electrostatic motor? The answer is in paragraph 0003 of Divoux et. al., U.S.P. Application No. 20040091201. The answer is a control signal. Control signals can be switched on and off by a hand actuated switch, an electromagnetic solenoid, a relay, or a transistor circuit. The fastest of these would be the transistor circuit, which can switch at 10^{-9} seconds in the best conditions. This is one billionth of a second. Many devices use transistors to switch and they only achieve 10^{-7} seconds because of the mechanical responses to the signal that the transistor provides. This is a ten millionth of a second. The LIGHT TRIGGERED LIGHT SWITCH is much faster at a one hundred billionth of a second. The electrostatic motor actuated by a control

signal of the OPTICAL MICRO-ACTUATOR is slower and inferior to the light actuated LIGHT TRIGGERED LIGHT SWITCH.

More OPTICAL MICRO-ACTUATOR Claims are as follows:

"Optical mixer comprising a plurality of optical micro-actuators conform with claim 1."

As we have shone repeatedly, a single OPTICAL MICRO-ACTUATOR works differently and much slower than a LIGHT TRIGGERED LIGHT SWITCH, but if a plurality of slow switches are run together the result will be even slower. The speed and superiority of the LIGHT TRIGGERED LIGHT SWITCH will be truer for a plurality of OPTICAL MICRO-ACTUATORS than it is for single OPTICAL MICRO-ACTUATORS.

More OPTICAL MICRO-ACTUATOR Claims are as follows:

"Use of a micro-actuator according to claim 1, in a component chosen from among optical relays,"

Divoux et. al., U.S.P. Application No. 20040091201 can be used as a optical relay by having the light coming into the cavity reflected by the interface between two optical fluids into another optical channel. The light then can be diverted into the second channel or not by the OPTICAL MICRO-ACTUATOR. The method of action is the movement of the interface between two optical fluids, and the movement is turned on by a control signal. LIGHT TRIGGERED LIGHT SWITCH of Patent Application 10/732,857 light is shut off from passing through the light channel because it is closed down to a dimension too small for the light to pass in response to the voltage

of light signal. Different from the interaction between light and the interface between two optical fluids, and a response to a light signal is very different from a control signal. Light signals can be switch on and off more than 100 times faster than a control signal.

More OPTICAL MICRO-ACTUATOR Claims are as follows:

"optical extinguishers,"

Divoux et. al., U.S.P. Application No. 20040091201 can be used as an optical extinguisher when the interface between two optical fluids is moved in the cavity to interfere with the light passing through as Claim 1 teaches. The OPTICAL MICRO-ACTUATOR fluids interact so that the light does not pass on to the next optical channel, but instead is caused to stop in the cavity not passing on. The LIGHT TRIGGERED LIGHT SWITCH of Patent Application 10/732,857 in it's Claim 1 teaches that the physical dimensions of the channel are closed down to extinguish the light. These are two very different functions. Further, the movement of the interface in the OPTICAL MICRO-ACTUATOR is in response to a control signal mentioned in paragraph 0003. While in the LIGHT TRIGGERED LIGHT SWITCH of Patent Application 10/732,857 light is shut off from passing through the light channel because it is closed down to a dimension too small for the light to pass in response to the voltage of light signal. No where in the OPTIBCAL MICRO-ACTUATOR is the voltage or power of the light signal mentioned. Again, two very different ways of functioning between these two patent applications.

More OPTICAL MICRO-ACTUATOR Claims are as follows:

"optical switches"

Divoux et. al., U.S.P. Application No. 20040091201 can be used as an optical switch when the interface between two optical fluids is moved in the cavity to interfere with the light passing through as Claim 1 teaches. The OPTICAL MICRO-ACTUATOR fluids interact so that the light is switched from passing on in one channel to pass on to a different optical channel. The LIGHT TRIGGERED LIGHT SWITCH of Patent Application 10/732,857 in it's Claim 1 teaches that the physical dimensions of the channel are closed down to extinguish the light. These are two very different functions. Further, the movement of the interface in the OPTICAL MICRO-ACTUATOR is in response to a control signal mentioned in paragraph 0003. While in the LIGHT TRIGGERED LIGHT SWITCH of Patent Application 10/732,857 light is shut off from passing through the light channel because it is closed down to a dimension too small for the light to pass in response to the voltage of light signal. No where in the OPTIBCAL MICRO-ACTUATOR is the voltage or power of the light signal mentioned. Again, two very different ways of functioning between these two patent applications.

More OPTICAL MICRO-ACTUATOR Claims are as follows:

"and optical attenuators."

Divoux et. al., U.S.P. Application No. 20040091201 can be used as an optical switch when the interface between two optical fluids is moved in the cavity to interfere with the light passing through as Claim 1 teaches. The OPTICAL MICRO-ACTUATOR fluids interact so that some of the light is adsorbed by one of the optical fluids or the interface between the optical fluids while passing on in optical channel. The LIGHT TRIGGERED LIGHT SWITCH of Patent

Application 10/732,857 never mentions that the light can be attenuated or adsorbed by the switch. These are two very different functions. Further, the movement of the interface in the OPTICAL MICRO-ACTUATOR is in response to a control signal mentioned in paragraph 0003. While in the LIGHT TRIGGERED LIGHT SWITCH of Patent Application 10/732,857 light is shut off from passing through the light channel because it is closed down to a dimension too small for the light to pass in response to the voltage of light signal. No where in the OPTICAL MICRO-ACTUATOR is the voltage or power of the light signal mentioned. Using a control signal dooms the OPTICAL MICRO-ACTUATOR to operating slower than the LIGHT TRIGGERED LIGHT SWITCH. Again, two very different ways of functioning between these two patent applications.

More OPTICAL MICRO-ACTUATOR Claims are as follows:

"Method for making an optical micro-actuator comprising the following steps: formation of a fluid chamber (40) on a first substrate (60) comprising a first electrode (144),"

The significance of the first electrode is that it is were the control signal voltage is applied to actuate the OPTICAL MICRO-ACTUATOR. Where the LIGHT TRIGGERED LIGHT SWITCH is actuated by a light signal's voltage. The will be slower than 10^{-9} seconds the can be more than one hundred times faster, and with the correct wavelength choices the LIGHT TRIGGERED LIGHT SWITCH can be ten thousand times faster than the OPTICAL MICRO-ACTUATOR would be using a control signal voltage.

The next words of Claims in the OPTICAL MICRO-ACTUATOR patent application are as follows:

"formation of at least one optical channel (12, 14) on a second substrate (64) and etching a cavity (30) separating two parts of the optical channel, assembly of the first substrate (60) and the second substrate, making the cavity coincide with the chamber, release of part of the first substrate, through a back face, to form a membrane (44) and expose the first electrode transfer of a third substrate (46, 48) comprising a second electrode (46) on to the first substrate, the third substrate being transferred onto the first substrate through shims (62) allowing movement of the membrane (44)."

The cavity coinciding with the chamber with a membrane for a wall allows an optical fluid with a surface in the cavity that will move up and down when the membrane is moved. The surface of the optical fluid is the interface of the two optical fluids that affects the light in the channel to be reflected, refracted, attenuated, or adsorbed. This way of functioning is different from and inferior to the action of the LIGHT TRIGGERED LIGHT SWITCH which shuts off light in a channel by making the channel dimensions too small as a piezoelectric element responds to the voltage in a light signal. No where in this claim is a piezoelectric element mentioned.

More OPTICAL MICRO-ACTUATOR Claims are as follows:

"Method according to claim 16, in which use is made of a first substrate comprising a solid silicon part (60), and of a stack on this solid part, said stack comprising an electrical isolating layer (62) and a non-isolating layer (144) in which: the fluid chamber is formed in a layer of material (42) covering the said stack, and when the membrane is released, the solid part of the first substrate is eliminated and at least one layer of the stack of layers is kept as a

membrane, the non-isolating layer of the stack forming an electrode fixed to the membrane."

Electrical isolating layers and non-isolating layers are need for the OPTICAL MICRO-ACTUATOR to work because it is actuated by a control signal unlike the LIGHT TRIGGERED LIGHT SWITCH which is actuated by the voltage in a light signal.

More OPTICAL MICRO-ACTUATOR Claims are as follows something like this:

Method according to one of the claims, in which an open chamber (40) is formed in a layer of material (42) of the first substrate and the said chamber is closed when the first and second substrates are assembled.

This closure allows the optical fluid to be contained and the interface moved by pressure. Again different from a piezoelectric element responding to the power of a light signal. The OPTICAL MICRO-ACTUATOR is different in form and function from the LIGHT TRIGGERED LIGHT SWITCH.

More OPTICAL MICRO-ACTUATOR Claims are as follows:

"Method for making a micro-actuator in a structure formed of a stack of layers, comprising the following steps: formation of at least one fluid chamber in the structure, with a rear part of the chamber comprising a first electrode, release of the part of the rear part of the chamber thus formed to make a membrane and to expose the first electrode, formation of at least one optical channel in the structure

and making a cavity separating at least two parts of the optical channel, the cavity being coincident with the chamber, formation of a second electrode facing the first electrode, this second electrode enabling movement of the membrane."

The electrodes mentioned in this claim are energized to actuate the OPTICAL MICRO-ACTUATOR switch by a control signal mentioned in paragraph 0003. No mention of a piezoelectric element is made in this claim. The LIGHT TRIGGERED LIGHT SWITCH is not actuated by a control signal turned on by an electric circuit as the OPTICAL MICRO-ACTUATOR is, but it is actuated by the voltage of a light signal. The inventions are very different.

More OPTICAL MICRO-ACTUATOR Claims are as follows:

"Method for making the optical micro-actuator, the method comprising the following steps: formation of at least one fluid chamber in a first substrate with a first layer comprising the first electrode and a second layer comprising the second electrode, these two electrodes being separated by an isolating layer, formation of at least the said optical channel in or on a second substrate and etching a cavity separating at least two parts of the optical channel, assembly of the first substrate and the second substrate, making the cavity coincide with the chamber, release of part of the first layer comprising the first electrode to form a membrane, by etching part of the isolating layer from the rear face of the first substrate."

The fluid chamber holds one optical fluid that has a top surface with the gas above it which is the second optical fluid that forms the interface between two optical fluids that is moved up and down by action of the membrane that is one chamber wall. The membrane is

actuated by the control signal voltage applied to the electrodes. The movement of the interface of the two optical fluids in the cavity is the way Divoux et. al., U.S.P. Application No. 20040091201 teaches that the OPTICAL MICRO-ACTUATOR works. On the other hand patent application 10/732,857 teaches that a piezoelectric element closes down an optical channel by responding to the voltage of a light signal. These applications describe very different ways their respective arts function. Divoux et. al., U.S.P. Application No. 20040091201 teaches that the OPTICAL MICRO-ACTUATOR has electrodes that control signals are applied to. The switching on and off of these control signals (paragraph 0003) could be switched by a manual switch, relay, solenoid, or transistor must switch an electrical signal or "control signal." The fastest of these is the transistor, which can switch in a billionth of a second (10^{-9} seconds). In the LIGHT TRIGGERED LIGHT SWITCH, the light in the channel crosses the switch dimensions in 10^{-13} seconds or faster depending on the size of the switch. Making the LIGHT TRIGGERED LIGHT SWITCH far superior in design.

Conclusion:

Please consider the arguments presented here. Please let the claims of patent application 10/732,857 be allowed.

Thank you for your time and effort.